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NATIONAL DAM SAFETY PROGRAM. GREEN SWAMP NUMBER 3 (NJ00211), PA--ETC(U)
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PASSAIC RIVER BASIN

WANAQUE RIVER, PASSAIC COUNTY

NEW JERSEY

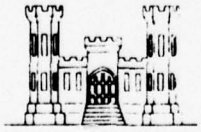
LEVEL II

GREEN SWAMP NO. 3

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NJ 00211



DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

JULY 1978

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00211	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE *(and Subtitle)*: Phase I Inspection Report National Dam Safety Program Green Swamp No . 3 Dam (NJ00211) Passaic County, N.J.	5. TYPE OF REPORT & PERIOD COVERED: (9) FINAL rept.
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7. AUTHOR(s): (10) Rudolph J. Wahanik	8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-78-C-0114
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Gilbert Associates, Inc. P.O. Box 1489 Reading, Pa. 19603	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: (12) 63p.
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106	12. REPORT DATE: (11) July [illegible]978
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16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

(6) National Dam Safety Program. Green Swamp Number 3 (NJ00211), Passaic River Basin, Wanaque River, Passaic County, New Jersey. Phase 1, Inspection Report.

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Dams--New Jersey
National Dam Safety Program Phase I
Dam Safety
Green Swamp no. 3 Dam, N.J.

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

25 AUG 1978

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Green Swamp Dam No. 3 in Passaic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given on the first two pages of the report.

Based on visual inspection, available records, calculations and past operational performance, Green Swamp Dam No. 3 is judged to be in fair condition. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Within six months of the date of approval of this report, the pool of water saturating the downstream toe should be drained and an engineering study initiated to determine the source of this water. The poor drainage of this area should be corrected.

b. Within one year of the date of approval of this report, the owner should initiate foundation investigations, including test borings and piezometers to determine the engineering characteristics of the embankment materials and based on this data perform a stability analysis of the dam. Any remedial measures found necessary should be initiated in calendar year 1979.

c. Within two years of the date of approval of this report a tree clearing, burrowing animal elimination and embankment reconditioning program should be initiated.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State

Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Robert A. Roe of the Eighth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, thirty days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia, 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,

James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Cy furn:
Mr. Dirk C. Hofman, P.E.
Department of Environmental Protection

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Green Swamp No. 3
State:	New Jersey
County:	Passaic
U.S.G.S. Quadrangle Sheet:	Wanaque, N.J.
Coordinates:	N 41°02'28" E 74°19'2"
Stream:	None (Off the Wanaque River)
Date of Inspection:	May 23, 1978

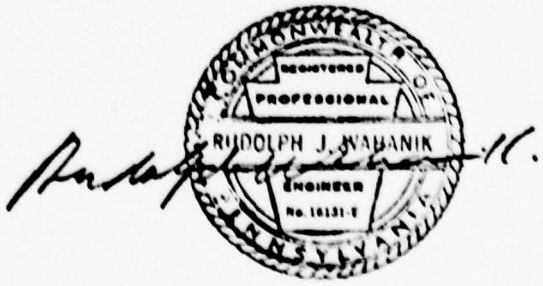
ASSESSMENT OF GENERAL CONDITION

The dam is in fair condition as defined in Appendix I. No items requiring immediate and drastic action were observed; however, it is recommended that the owner's attention be directed to the following items:

1. The pool of water saturating the downstream toe be drained soon by improving the drainage swale; a determination should be made as to whether the water is due to poor drainage, springs, or seepage from the dam (this dam has no impervious zone upstream of the concrete corewall, nor has any foundation grouting been performed).

2. A foundation investigation, including test borings and piezometer installation, be conducted in the future to determine the engineering characteristics of the embankment materials, and a stability analysis be performed.

3. A tree clearing and embankment reconditioning program be initiated within the next two years including applying topsoil and seeding of the embankment.



(Continued)

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c. Within two years of the date of approval of this report a tree clearing, burrowing animal elimination and embankment reconditioning program should be initiated.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 25 Aug 78

June 1978

OVERVIEW - GREEN SWAMP NO. 3

TABLE OF CONTENTS

1.0 PROJECT INFORMATION

1.1 GENERAL

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the U.S. Corps of Engineers to initiate a national program of safety inspections of non-Federal dams throughout the United States. Gilbert Associates, Inc. has entered into contract number DACW61-78-C-0114 with the Philadelphia Office of the U.S. Corps of Engineers to inpect this dam, Gilbert Work Order 06-7249-050.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the U.S. Army Corps of Engineers Recommended Guidelines for Safety Inspection of Dams (Reference 1) and contract requirements between Gilbert Associates, Inc. and the Corps of Engineers. The objectives are to expeditiously identify whether this dam apparently poses an immediate threat to human life or property, and to recommend future studies and/or any obvious remedial actions that may be indicated by the inspection.

1.2 PROJECT DESCRIPTION

1.2.1 Dam and Appurtenances: The Green Swamp Dam No. 3 is an 18-foot high, 135-foot long earthfill dam with a concrete corewall extending down a maximum depth of 24 feet to rock according to the construction drawings. There was neither an upstream impervious zone constructed against the concrete corewall, nor foundation grouting performed. The upstream slope of the embankment is lined with riprap. There are no outlet provisions at the dam. The water level is controlled at the Wanaque Overflow Weir (NJ 00214) which is a separate structure.

1.2.2 Location: The dam is located about 1.3 miles northwest of Haskell, N.J., or about 2.0 miles north of Bloomingdale, N.J. This dam lies on the southwest rim of the Wanaque Reservoir and at a distance of about 1.2 miles west of the main dam (Raymond Dam, see Figure 1). Geologically, the dam is located within the physiographic province of the Precambrian Highlands, composed of granitic gneiss and biotite gneiss (see Appendix F).

1.2.3 Size Classification: The dam is classified as an intermediate structure because of its impoundment (38,670 acre-feet), in accordance with Section 2.1.1 of Reference 1.

1.2.4 Hazard Classification: The dam is located upstream of a moderately populated flood plain. The dam is classified as a high hazard potential based on the requirements of Section 2.1.2 of Reference 1.

1.2.5 Ownership: The dam is owned and maintained by the North Jersey District Water Supply Commission (NJDWSC), a New Jersey state commission. They have engineering and maintenance facilities located at Raymond Dam in Wanaque, N.J. The Chief Engineer of the NJDWSC in Wanaque is Mr. Dean C. Noll. The address is:

North Jersey District Water Supply Commission
Ringwood Avenue
Wanaque, N.J. 07465

1.2.6 Purpose of Dam: The Green Swamp Dam No. 3 serves as a dam which closes off a low area in the rim of the Wanaque Reservoir. The Reservoir supplies water to residents of Paterson, Passaic, Clifton, Montclair, Glen Ridge, Newark, Kearny, and Bayonne, New Jersey.

1.2.7 Design and Construction History: Green Swamp Dam No. 3 was constructed from July 24, 1924 to November 20, 1926 by Winston & Company, Inc. of Kingston, N.Y., as part of the total Wanaque Project. The project began in 1920 and was completed with the reservoir being filled by March 4, 1929. The original design records could not be located by the staff of the NJDWSC at Wanaque. However, publications indicate the design was performed by employees of the NJDWSC with the assistance of individual consultants, as required. The New Jersey Department of Environmental Protection (DEP) has monthly progress inspection reports and several photographs taken during construction. There is no indication of subsequent construction other than minor maintenance.

1.2.8 Normal Operational Procedures: There is no operational procedure for this dam. Adequate freeboard is relied on to contain storm surges, with overflow handled by the Overflow Weir (NJ 00214) located 1.0 mile east of Green Swamp Dam No. 3.

1.3 PERTINENT DATA

1.3.1 Drainage Area: 90.4 square miles

1.3.2 Discharge at Dam Site: None

1.3.3 Elevation: (Feet above MSL)

Top of Dam - 310.0
Maximum Spillway Design Flood (SDF) Surcharge - 308.8 (See Section 5.0)
Full Flood Control Pool - Not Applicable
Recreation Pool - Not Applicable
Spillway Crest (gated) - Not Applicable
Upstream Portal Invert Diversion Tunnel - Not Applicable
Downstream Portal Invert Diversion Tunnel - Not Applicable
Streambed at Centerline of Dam - 292 (low point of topography)
Maximum Tailwater - Not Applicable

1.3.4 Reservoir: Length of Maximum Pool - 6.1 miles

1.3.5 Storage (acre-feet):

Recreation Pool - Not Applicable
Flood Control Pool - Not Applicable
SDF Surcharge - 36,210
Top of Dam - 38,670

1.3.6 Reservoir Surface (acres):

Top of Dam - 2,620
SDF Surcharge - 2,590
Flood Control Pool - Not Applicable
Recreation Pool - Not Applicable

1.3.7 Dam: Type - earthfill with concrete corewall

Length - 135 feet
Height - 18 feet above original surface; 24 feet above base of concrete corewall.
Top Width - 12 feet
Side Slope - U/S 2 horizontal:1 vertical (top) to 3 horizontal:1 vertical (lower part)
D/S 2 horizontal:1 vertical to 3 horizontal:1 vertical (toe)
Zoning - None
Impervious Core - Concrete corewall with top elevation 305.0 and extending to final rock surface.
Cutoff - A shallow cutoff in foundation rock is formed by the base of the concrete corewall.
Grout Curtain - None required.

1.3.8 Diversion and Regulating Tunnel: Not Applicable

1.3.9 Spillway: Not Applicable

1.3.10 Regulatory Outlet: Not Applicable

2.0 ENGINEERING DATA

2.1 DESIGN

A plan, profile, and maximum section through the dam are shown on original record tracings which are on file at the NJDWSC engineering office (Mr. Dean C. Noll) at Wanaque, N.J. (See Figure 2). No original design data were available other than results mentioned in the North East Water Works Association publication (Reference 3) and a 1925 report (Reference 2) by the Commissioner of the NJDWSC.

2.2 CONSTRUCTION

Contract drawings, specifications, and record drawings are available at the NJDWSC engineering office. Periodic inspection reports, news clippings, and photographs are available in dam application number 32 at the New Jersey Department of Environmental Protection. They indicate that satisfactory quality construction work was performed on the project in general. Dam No. 3 was constructed over a 28 month period starting in July 1924.

2.3 OPERATION: Not Applicable

2.4 EVALUATION

2.4.1 Availability: Embankment material characteristics, subsurface foundation conditions, and engineering design analysis data are not available.

2.4.2 Adequacy: The design and construction data received or reviewed are inadequate for an evaluation in this Phase I dam safety report.

2.4.3 Validity: Based on the visual inspection, the specifications and record drawings appear to be consistent with existing structures, except for slight variations in the upstream and downstream slopes of Dam No. 3.

3.0 VISUAL INSPECTION

3.1 FINDINGS

3.1.1 General: The Phase I dam inspection was performed on May 23, 1978 by a team of Gilbert Associates, Inc. Engineers. One previous inspection of this dam was performed on April 5, 1977 by Joseph Foley, Roscoe Jenning, and Doug De Lorie of the NJDWSC; a copy of that report is attached here as Appendix E.

3.1.2 Dam: Some slight sloughing along the downstream slope was observed; the material exposed is mainly silty sand and small gravel. A large size burrow hole was seen on the upper part of the downstream slope, 2-1/2 feet below the crest. The crest of the dam is covered with tufts of grass; shrubs and trees up to 6 inches in diameter cover the upstream slope; trees up to 11 inches in diameter were observed on the downstream slope. A pool of stagnant water is ponded against the downstream slope, to elevation 298 feet. A water depth of 8-9 inches was measured along the perimeter of the pond. At a distance of 250 feet downstream from the pool, water is flowing at an estimated 2-5 gpm with the reservoir water elevation at 302.4 feet.

The steep left abutment and gentle right abutment rock appear to be in good contact with the embankment. The massive and fresh-looking granitic gneiss and biotite gneiss as exposed at the dam site may indicate a good foundation condition for the concrete corewall. The reservoir rim has a stable rock slope and is covered with a relatively dense stand of trees.

One or two trees on the dam crest had been cut.

3.1.3 Appurtenant Structures: There are no flow or flood control structures at this dam.

3.1.4 Reservoir Area: The slopes of the reservoir near the dam site appear to be generally stable. The rim of the reservoir is covered with vegetation.

3.2 EVALUATION:

The small swamp occupies a part of the downstream slope, apparently formed because of a natural poor drainage condition at the downstream valley bottom. The water level in the swamp was about 4.7 feet below the reservoir pool level at the time of inspection. The swamp is believed to be fed by the local surface drainage and springs, although the actual source of the water must be determined. There are some doubts on the foundation watertightness because of the fact that foundation grouting was not

performed and an upstream impervious zone was not constructed for this dam. The probable high phreatic surface within the downstream embankment, resulting from the high water level of the swamp, is a major concern with respect to the long-term stability of the dam; therefore, a follow-up in-depth investigation and stability analysis are necessary. Trees growing on the embankment should be cut off and removed to prevent deep penetration of the root system in the future. The burrow hole should be fully excavated and backfilled with compacted granular material.

3.3 ATTENDEES

New Jersey Department of Environmental Protection

Larry Woscyna

Gilbert Associates, Inc.

Rudolph J. Wahanik
Fine T. Hsu
Rudy P. Visser

4.0 OPERATIONAL PROCEDURES

4.1 PROCEDURES

The water level in Wanaque Reservoir is maintained at a pool elevation of 302.4 feet MSL by the Overflow Weir located 1 mile away. The highest water elevation recorded since October 1950 was 303.9 feet with excess flow passing over the uncontrolled weir. There is no operational procedure at Green Swamp Dam No. 3.

4.2 MAINTENANCE OF DAM

The reservoir rim is traversed daily by NJDWSC guards who report observed maintenance problems to the Chief Engineer. In addition, periodic inspections are made by engineers and/or other personnel of the NJDWSC and reports are written regarding maintenance requirements. The 1977 inspection report (Appendix E) recommended removal of trees on both sides of the dam. The trees had not been removed at the time of inspection. The NJDWSC has foresters employed to cut trees and otherwise maintain the woodlands on their property.

4.3 MAINTENANCE OF OPERATING FACILITIES - There are no operating facilities at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No automatic warning systems exist at this dam. A daily patrol is made by the NJDWSC security guards equipped with radios. According to NJDWSC personnel, the guards are instructed to radio the guard house, or failing that, to directly radio the Wanaque police of any obvious, impending hazard to residents from the dams on the Wanaque Reservoir.

4.5 EVALUATION

Several 5 to 6-inch diameter trees had been cut and left lying on the crest; however, additional tree clearance is required.

Measures must be taken by the owner to ensure adequate drainage of the tailwater.

5.0 HYDRAULIC/HYDROLOGIC DATA

5.1 EVALUATION OF FEATURES

Other than the dam, there are no hydraulic structures or control facilities at this location. Reservoir overflow is provided by the Overflow Weir, located 1 mile to the east. Details on the methodology used and the hydraulic and hydrologic computations are presented in Appendix D.

5.1.1 Design Data: The maximum pool elevation for the design discharge of 18,000 cfs is 304.3 feet. This is based on a spillway elevation of 300.3 feet plus a head of 4.0 feet, for the Overflow Weir. With the flashboards in place, the overflow structure becomes a sharp edged weir with an elevation of 302.4 feet, and a pool elevation of 306.6 feet with the design flow of 18,000 cfs.

5.1.2 Experience Data: The maximum recorded reservoir level since October, 1950 is 303.9 feet, 6.1 feet lower than the crest of Green Swamp Dam No. 3. This water level was reached in March, 1951. (References 6 and 7)

5.1.3 Visual Observations: There is no visual evidence to indicate the dam has ever been overtopped.

5.1.4 Overtopping Potential: The Probable Maximum Flood (PMF), when developed as described in Appendix D and with the flashboards in place in the Overflow Weir, results in a reservoir elevation of 308.8 feet. One-half the PMF results in a reservoir elevation of 306.0 feet, with the flashboards in place.

5.1.5 Reservoir Drawdown: The existing emergency drawdown facilities installed in the several dams of the Wanaque Reservoir are not adequate to lower the water level of the reservoir in a short period of time. It is recommended that the owner design and construct water release structures that will allow lowering of the water level within an acceptable period of time.

A preliminary evaluation of the performance of the existing drawdown facilities is given in Appendix D. The time required to draw down the reservoir to the bottom surface level of Green Swamp Dam No. 3 (292 feet) using the existing facilities at the Raymond Dam is:

System in Use	Time in Days
Aerator System	49
36-inch Diameter Blowoff	150
Aerator and Blowoff	36

6.0 DAM STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

6.1.1 Visual Observations: The existence of the small swamp with a water level which is higher than the toe of the downstream embankment has raised the phreatic surface within the downstream embankment. The high phreatic surface and poor toe drainage condition presents a potential safety hazard due to long term slope instability which would require further in-depth studies and analyses.

It is believed that the downstream swamp is probably caused by poor drainage condition at the downstream valley bottom and is probably fed by local springs and surface drainage, rather than from steady seepage beneath the dam. However, the supporting evidence must be obtained during a follow-up investigation.

The presence of a large burrow indicates that wild animals could dig deeply into the embankment and pose a threat to the safety of the dam. A number of large trees growing on the embankment have adverse effects on the stability of the embankment if the root system penetrates deeply into the concrete corewall joints or the interface between the dam and abutments.

6.1.2 Design and Construction Data: On the basis of the record drawing, this dam was found to have neither an impervious zone on the upstream side of the concrete corewall, nor foundation grouting in the corewall foundation area. The watertightness of the dam depends solely on the narrow concrete corewall and assumed competent and tight foundation rocks. The possiblity of minor leakage through the concrete corewall joints and foundation cannot be ruled out because of the presence of a small swamp at the downstream toe. Original stability studies and analyses are not available for assessment. Follow-up investigation, studies, and analysis of seepage and stability are needed for this dam.

6.1.3 Operating Records: Not Applicable

6.1.4 Post Construction Changes: None

6.1.5 Seismic Stability: This dam is located within Zone 1 on Algermissen's Seismic Risk Map of the United States (1969 edition). There are questions with respect to the static stability of the dam, as set forth in paragraph 6.1.1, and, therefore, in accordance with paragraph 3.6.4 of Reference 1, no assumptions can be made as to the seismic stability of the dam.

Further studies are required to assess the seismic stability of the dam if judged appropriate when considering results of future studies outlined in paragraph 7.1.4.

7.0 ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

The assessment and remedial measures contained herein are based on the provisions contained in Appendix I, "Conditions."

7.1 DAM ASSESSMENT

7.1.1 Safety: Based on the visual inspection, the existence of a small swamp at and above the downstream toe area, a large burrow in the embankment, and a number of trees growing on the embankment indicate that the condition of this dam is fair. From a watertightness and foundation stability viewpoint Dam No. 3 is probably inferior in design to most of the dams on the Wanaque Reservoir because of the lack of an upstream impervious zone adjacent to the concrete corewall and because of the absence of foundation grouting.

7.1.2 Adequacy of Information: Foundation condition and material data are not on record for use in evaluating the dam. The record drawing indicates that grouting was not necessary at this dam, but documentation regarding the explanation of the foundation condition is not available.

7.1.3 Urgency: This dam is not in an imminently hazardous condition based on the visual inspection. There is no urgent need for immediate and drastic action. However, the source of impounded water at and above the downstream toe area needs to be studied soon.

7.1.4 Necessity for Further Studies: The existing high tailwater at the toe area necessitates additional studies, investigations, and analyses on seepage and stability of the dam. Additional visual inspection will be needed after the swamp is drained or test-pumped to determine the seepage or spring location. The pH value, temperature of water, and other chemical qualities of the water should be determined at various sampling locations. Foundation and embankment material investigations including test borings, piezometer installation and observation, and soil testing should be made to analyze structural stability and seepage condition.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

7.2.1 Alternatives: In order to drain the swamp at Green Swamp Dam No. 3, the invert of the natural drainage swale could be lowered, or a newer, shorter route chosen (which would include a considerable amount of rock drilling and blasting). An alternate is to drill holes from the downhill side to permit drainage. A subsequent visual inspection of the swamp area should be made when the swamp is drained.

7.2.2 Operational and Maintenance Procedures: Clearing of large trees and stumps and prevention of tree growth on the embankment should be performed within the next two years. All burrows in the embankment should be backfilled with select compacted granular material. The cleaned ground surface should be redressed with top soil and seeded with select grass.

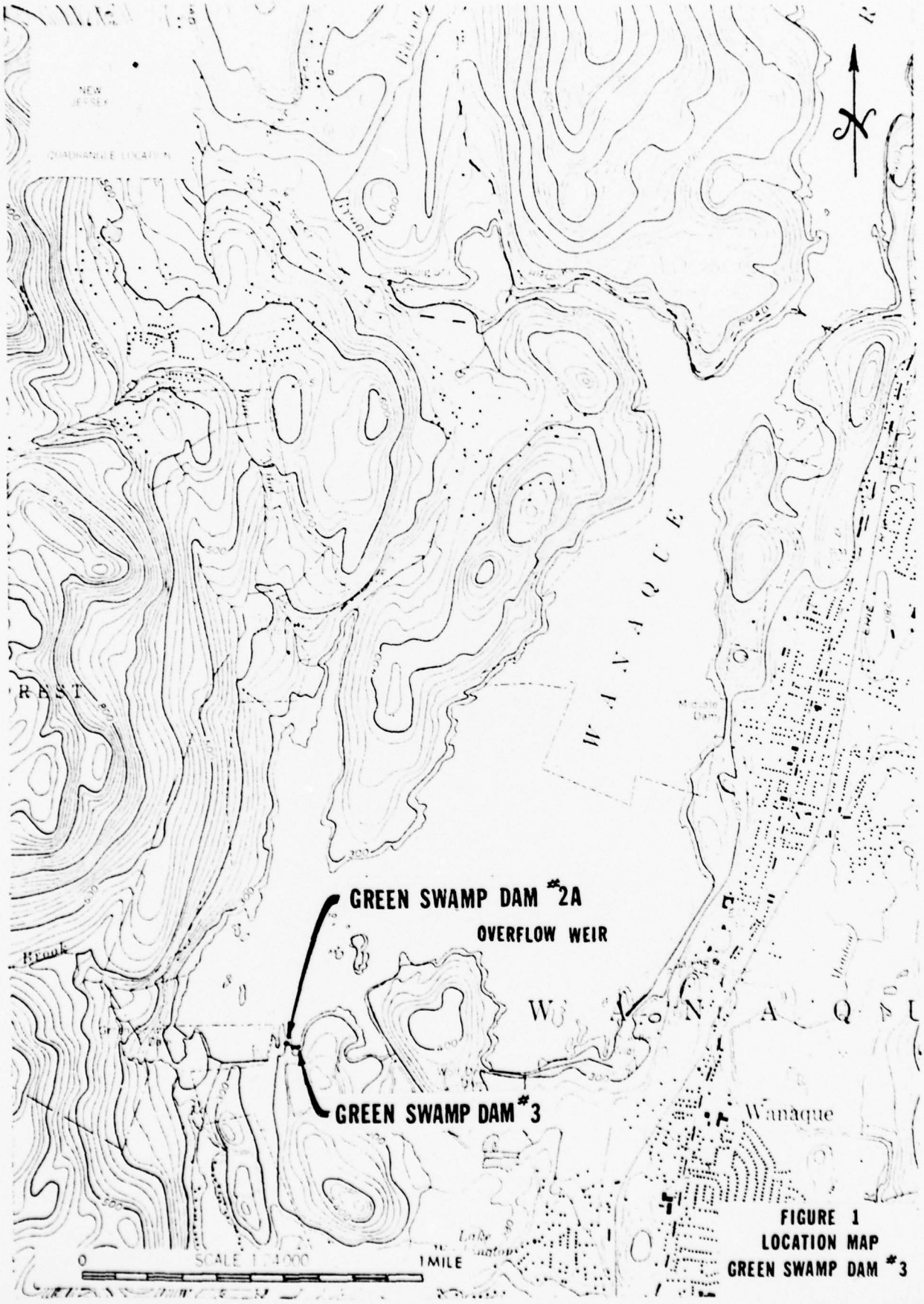
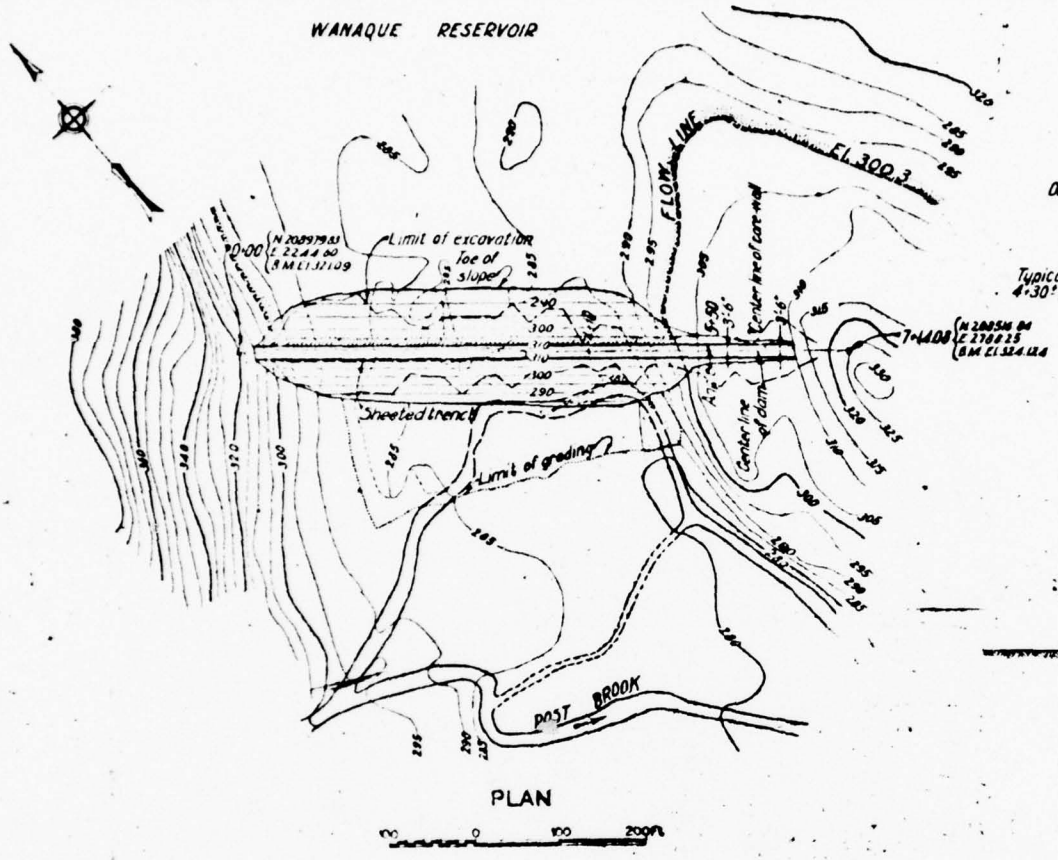
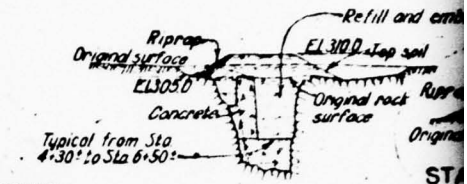
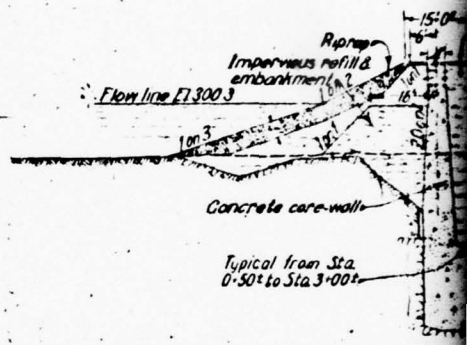
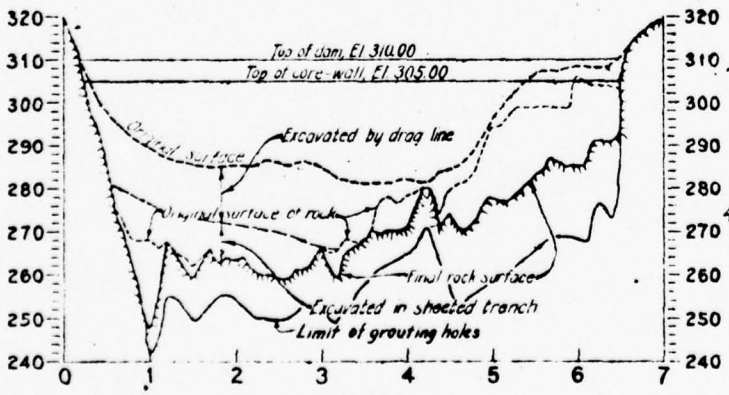


FIGURE 1
LOCATION MAP
GREEN SWAMP DAM #3









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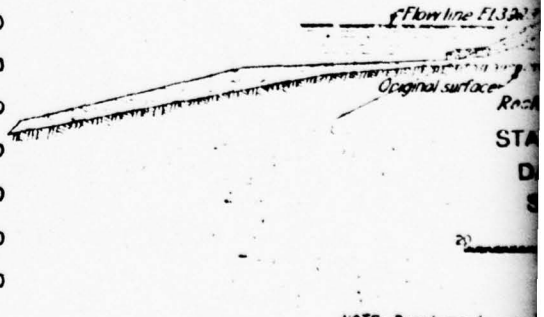
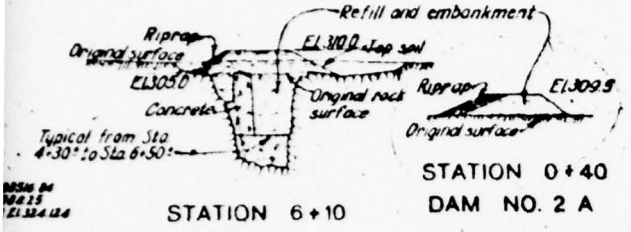


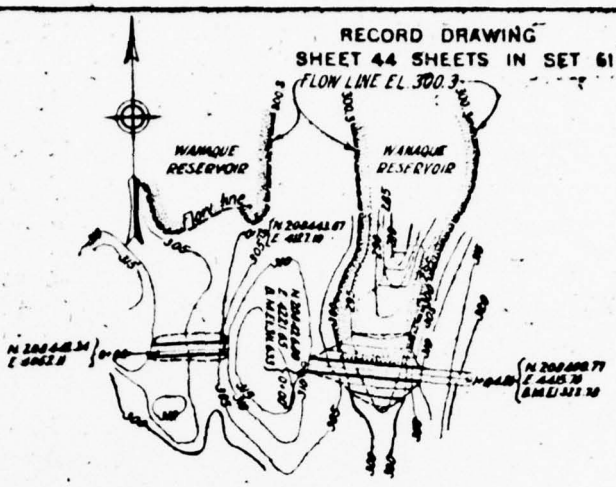
NOTE:- Bench marks are

RECORD DRAWING
SHEET 44 SHEETS IN SET 61

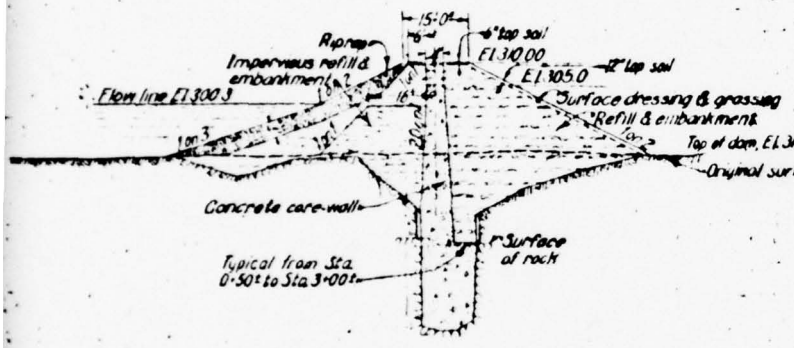


STATION 6+10
DAM NO. 1

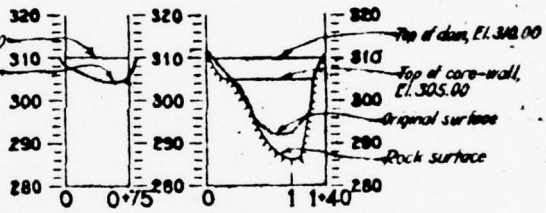
STATION 0+40
DAM NO. 2 A



PLAN

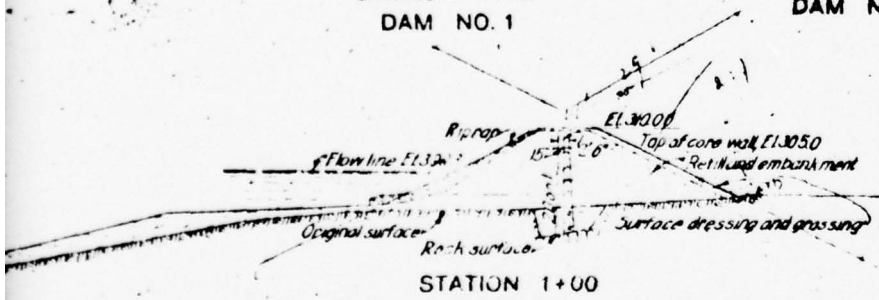


STATION 1+00
DAM NO. 1



PROFILES
DAM NO. 2 A DAM NO. 3

Note: Holes drilled to depth of 10 ft but no grout necessary at dam no. 3



STATION 1+00
DAM NO 3
SECTIONS

NOTE - Bench marks are ½" brass rods caulked into ledge rock

CONSTRUCTION RECORD
Dam No. 1 built July 5, 1924, to Oct. 10, 1926.
Dam No. 2A built Sept. 2, 1927, to Sept. 16, 1927.
Dam No. 3 built July 24, 1924, to Nov. 20, 1926
under Contract 7, Clifford F. MacEvoy Co.
Newark, N.J. Contractor, in accordance with
this record drawing.

Engineer in charge
NORTH JERSEY DISTRICT
WATER SUPPLY COMMISSION

WANAQUE RESERVOIR
GREEN SWAMP DAMS
NUMBERS 1, 2 A AND 3
PLANS, PROFILES AND SECTIONS

APRIL 30, 1931 FIGURE 2

Asst. Chief Engineer

CASE DP. File-342.9 Acc. 3244

2

APPENDIX A

VISUAL CHECKLIST

Check List
Visual Inspection
Phase I

Name Dam: Greenswamp #3 & Greenswamp #2A (See Appendix H) County: Passaic State: New Jersey Coordinators: Philadelphia District Corps of Engineers

Date(s) Inspection: May 23, 1978 Weather: Sunny Temperature: 75°F

Pool Elevation at Time of Inspection: 302.7* M.S.L. Tailwater at Time of Inspection: 298 M.S.L.

Gilbert Associates, Inc.
Inspection Personnel:

Rudolph J. Wahanik

Fine T. Hsu

Rudy P. Visser

Also Present:

Larry Woscyna - New Jersey Department of Environmental Protection

Rudy P. Visser - Recorder

* Recorded today at gaging station.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Not applicable	
STRUCTURAL TO ABUTMENT/ EMBANKMENT FUNCTIONS	Not applicable	
DRAINS	Not applicable	
WATER PASSAGES	Not applicable	
FOUNDATION	Not applicable	
SURFACE CRACKS CONCRETE SURFACES	Not applicable	
STRUCTURAL CRACKING	Not applicable	
VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable	
MONOLITH JOINTS	Not applicable	
CONSTRUCTION JOINTS	Not applicable	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Dam No. 3 - None - The crest surface and downstream slope are sparsely covered with tufts of grass, shrubs, and some trees. Dam No. 2A - None - (See Appendix H)	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None - Either Dam	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Dam No. 3 - Both abutments are rock outcrops; the downstream slope has an animal burrow under a 4-inch diameter tree, 2.5 feet below the dam crest in the center of dam. Both slopes are covered with bushes and small trees on the upstream slopes and larger trees on the downstream slope. Some slight sloughing along the downstream slope was visible. Dam No. 2A - None - Toe of dam about 25 feet from water's edge. This area is filled with trees with diameters up to 10 inches. (See Appendix H).	Remove all trees and shrubs from both slopes, excavate and fill in all animal burrows.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Dam No. 3 - There is no vertical deviation to be seen; the crest is fairly level. Dam No. 2A - The crest is slightly depressed in the centers (about 6 inches). The dam crest has a horseshoe shape with a width of 9 feet at the left abutment, becoming 47 feet at the right abutment. (See Appendix H).	
RIPRAP FAILURES	None - The slopes are in good condition - the only movement is caused by several trees growing in the riprap.	
EMBANKMENT CREST, UPSTREAM AND DOWNSTREAM SLOPES	Dam No. 3 - Crest: It is covered with shrubs and young trees including 35-foot high, 4 to 6-inch diameter birch trees. Downstream slope: Covered with trees up to 11 inches in diameter. Dam No. 2A - Crest: covered with young tree growth, 2 to 4 inches in diameter (see Appendix H).	Remove all shrubs and trees from the dam surfaces.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Dam No. 3 - Contact of embankment and abutment rocks appears to be in good condition. Dam No. 2A - Same. (See Appendix H)	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Dam No. 3 - No seepage noticed; however, directly against the toe of the downstream slope is a 45-foot wide pool of stagnant, drak brown water, 8 to 9 inches deep at the edge with an exit which at 250 feet south of the dam flows at about 5 gpm. This water seems to be trapped in a depression in the rock. Some of this flowing water may be attributed to surface water.	Remove fallen trees which impede flow of water, and deepen pool exit drain to keep the water off the toe of the dam is downstream.
	Dam No. 2A - None.	
STAFF GAGE AND RECORDER	Not Applicable	
DRAINS	Not Applicable	

OUTLET WORKS - (NONE AT GREEN SWAMP DAM NO. 3 OR DAM NO. 2A)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not Applicable	
INTAKE STRUCTURE	Not Applicable	
OUTLET STRUCTURE	Not Applicable	
OUTLET CHANNEL	Not Applicable	
EMERGENCY GATE	Not Applicable	

UNGATED SPILLAY (NONE AT GREEN SWAMP DAM NO. 3 or DAM NO. 2A)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Not Applicable	
APPROACH CHANNEL	Not Applicable	
DISCHARGE CHANNEL	Not Applicable	
BRIDGE AND PIERS	Not Applicable	

GATED SPILLWAY (NONE AT GREEN SWAMP DAM NO. 3 OR DAM NO. 2A)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not Applicable	
APPROACH CHANNEL	Not Applicable	
DISCHARGE CHANNEL	Not Applicable	
BRIDGE AND PIERS	Not Applicable	
GATES AND OPERATION EQUIPMENT	Not Applicable	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None was observed	
OBSERVATION WELLS	None was observed	
WEIRS	None was observed	
PIEZOMETERS	None was observed	
OTHER	None was observed	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Dam No. 3 - A continuous steep rock slope and high hills lie along the east shoreline and left abutment of the dam; also a gentle ledge rock knoll intrudes into the reservoir along the west shoreline near the dam. All the rock slopes along the rim of the reservoir near the dam are in a stable condition.	None.
SEDIMENTATION	The reservoir boundary is tree lined. The stable reservoir rock slope and dense vegetation cover near the dam site protect the area from excessive erosion and formation of sediments.	With a thin soil mantle not much soil can wash into the reservoir.

DOWNSTREAM CHANNEL (NONE AT GREEN SWAMP DAM NO. 3 OR DAM NO. 2A)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Not applicable	
SLOPES	Not applicable	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately 150 homes are downstream of the dam with an estimated population of 500 people.	

APPENDIX B

ENGINEERING DATA CHECKLISTS

APPENDIX B
CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	A tracing of the record drawing is available at the NJDWSC office in Wanaque, N.J. (hereafter referred to as NJDWSC-W).
REGIONAL VICINITY MAP	The USGS Wanaque, N.J. 7-1/2 min. quadrangle map is available.
CONSTRUCTION HISTORY	The 1925 Commissioner's Report (Reference 2) is available at NJDWSC-W. There is also a 1930 and a 1931 Commissioner's report at NJDWSC-W, an article on the construction was printed in the N.E.W.W.A. Journal (Reference 3) during construction. Some photos are available in the NJDWSC-W and the N.J. Dept. of Environmental Protection offices in Trenton, N.J. (DEP).
TYPICAL SECTIONS OF DAM	A section through the dam is shown on record drawing No. 44 of 61 (see Figure 2) which is available at NJDWSC-W.
HYDROLOGIC/HYDRAULIC DATA	Records are available at NJDWSC-W and some are printed in USGS reports.
OUTLETS - PLAN	Not Applicable
- DETAILS	Not Applicable
- CONSTRAINTS	Not Applicable
- DISCHARGE RATINGS	Not Applicable
RAINFALL/RESERVOIR RECORDS	Excellent records are available from the USGS and NJDWSC-W from the time of construction of this dam.

APPENDIX B (Continued)

ITEM	REMARKS
DESIGN REPORTS	Design reports are not available; however, a brief description of the dam design can be found in the North Jersey District Water Supply Commission's Report 1925. (Reference 2)
GEOLOGY REPORTS	Geologic reports of this dam site are not available.
DESIGN COMPUTATIONS HYDROLOGY& HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design calculations, dam stability, or seepage studies were not available at NJDWSC-W. Complete original design calculations for this dam do not appear to be in the DEP files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Impervious borrow materials for the Wanaque reservoir project were investigated as shown on drawings Contract 7, sheet 3; Contract 2, sheets 10, 11, and 12, including test boring data available at the NJDWSC-W. Test borings at foundation area of the dam were not available. Laboratory tests were not reported. Foundation grouting hole records are shown in Drawing Sheet 47 in set 61 - No grouting was performed.
POST-CONSTRUCTION SURVEYS OF DAM	See Record Drawing Sheet 44 in set 61 showing as-built section, profile, and plan (see Figure 2 of this report).
BORROW SOURCES	All impervious materials required for constructing the impervious layer upstream apparently came from the original nearby flood plains prior to their submergence. Scattered borrow areas encircled by Midvale, Raymond, and Wolf Den Dams were shown in Drawing Sheet 3 in Set 31, Contract 7.
SPILLWAY PLAN	Not Applicable
SECTIONS	Not Applicable
DETAILS	Not Applicable

APPENDIX B (Continued)

ITEM	REMARKS
OPERATING EQUIPMENT PLANS & DETAILS	Not Applicable
MONITORING SYSTEMS	None observed.
MODIFICATIONS	No modifications from the design of the dam were observed.
HIGH POOL RECORDS	Records exist at the NJDWSC-W and USGS publications.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Annual reports for certain years are in dam file No. 32 of DEP.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Operational levels of the reservoir are available from NJDWSC-W.

APPENDIX B (Continued)

CHECK LIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC DATA

DRAINAGE AREA CHARACTERISTICS: Densely forrested, few homes, very hilly with minimal cover on bedrock.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 302.4 feet (22,250 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not Applicable

ELEVATION MAXIMUM SPILLWAY DESIGN FLOOD POOL: 308.8

ELEVATION TOP OF DAM: 310.0 feet

CREST: Soil and grass

a. Elevation: 310.0 feet
b. Type: Non-overflow
c. Width: 12 feet (measured)
d. Length: 135 feet (measured)
e. Location Spillover: Not Applicable
f. Number of Type of Gates: Not Applicable

OUTLET WORKS:

a. Type: None
b. Location: None
c. Entrance inverts: None
d. Exit inverts: None
e. Emergency drawdown facilities: None

HYDROMETEOROLOGICAL GAGES:

a. Type: Rainfall recording chart, 24-hour precipitation can, and maximum and minimum temperature recorder. Float type continuous stream level recorder with drum chart.

b. Location: Raymond Dam in Wanaque, New Jersey.

c. Records: Weather data published as climatological Data-Wanaque-Raymond Dam by the National Oceanic and Atmospheric Administration. Streamflow data is recorded by the USGS.

MAXIMUM NON-DAMAGING DISCHARGE: Not applicable, this is a non-overflow dam.

APPENDIX C

PHOTOGRAPHS

June 1978

DOWNSTREAM SLOPE WITH POOL OF WATER

June 1978

DOWNSTREAM SLOPE LOOKING WEST

APPENDIX D

HYDRAULIC AND HYDROLOGIC COMPUTATIONS

Complete Hydraulic & Hydrologic Computations are on file in the U. S. Army Engineer District, Philadelphia Office. Copies of the computations will be made available when typing, drafting and reproduction are completed.

APPENDIX E

PREVIOUS INSPECTION REPORTS

NORTH JERSEY DISTRICT WATER SUPPLY COMMISSION

M E M O R A N D U M

TO: Dam Inspection File

FROM: Joseph Foley, Engineer

DATE: April 5, 1977

On March 31, 1977 Roscoe Jennings, Doug De Lorie and I inspected the dams at the Wanaque Reservoir; the following is a report on their conditions and recommendations on maintenance of same.

FURNACE ROAD DAM

Condition: There are trees and brush on the wet and dry sides of the dam and also a small swamp of apparently trapped water behind the dam.

Recommendations: The trees should be killed and removed using poison suitable for potable water.

MIDVALE DAM

Condition: Some trees are growing on the wet and dry sides of the dam. There is a small spring flowing from the foot of the dam at the north end. Wet spots and soft wet sand are also apparent at the foot of the dam. No sink holes or other indications of dam failure were apparent at this location. A sample of water from this spring and a sample from the reservoir were taken and anlyzed, the results are as follows:

Spring Water:	Specific conductivity	68
	pH	6.3
Reservoir Water:	Specific conductivity	102
	pH	6.9

The results indicate that this water is more likely to be ground water than reservoir water. (For additional information, please refer to a memo from Bob Wieland to George Destito dated May 3, 1976).

Recommendations: The trees on the dam should be killed and removed. The dam should also be checked periodically to be sure the spring is not a leak in the dam.

RAYMOND DAM

Condition: Excellent

SPILLWAY

Condition: Good, except that it was indicated by Ernie Restaino that there is a small leak in the spillway. I did not observe it because of the overflow. I will check it again when the reservoir goes down.

Recommendations: The leak in the spillway should be fixed when the reservoir goes down.

WOLF DEN DAM

Condition: There are trees and shrubs on both the wet and dry sides. There are small springs flowing from the low sections behind the dam. Some samples were also taken here and the results were that the water had a specific conductivity of 90 and a pH of 6.3, so this water is most likely ground water also.

Recommendations: I recommend that the trees and shrubs be removed.

GREEN SWAMP

#4 Dam

Condition: The general condition of the dam is good, although sections of the gunite surfacing are cracked and have fallen off (especially near the expansion joints), due to moisture that found its way under the gunite. There was water running out of the drain but this flow was not excessive.

Recommendations: The cracked and loose gunite should be chipped away and replaced and at the expansion joints, the gunite should be chipped and tar poured in to allow expansion of the concrete.

#3 and #2A Dams

Condition: Both small dams are heavily wooded and there is a small swamp behind the #3 dam.

Recommendations: The only recommendation for these dams is that the trees be removed from both sides of the dams.

#2 Dam

Condition: This dam is in excellent condition, except around the expansion joints where the gunite is cracked due to the fact that no allowance was made for expansion when the guite was applied to the dam. There is also a swamp behind this dam, but this looks like a natural swamp.

Recommendations: The gunite at the expansion joints should be chipped away and tar poured in to allow expansion and any other cracks in the gunite should be chipped and repaired.

#1 Dam

Condition: There are trees and shrubs on both wet and dry sides of this dam. There is also a swamp behind the dam.

Recommendations: The dam should be cleared of trees and shrubs.

As a result of my research, so far on dam inspection, I received a booklet, "Supervision of Dams by State Authorities" published by the United States Committee on large dams, July 1966. This publication had little information on the actual inspection of dams but it did have some useful information such as: the function of dam supervision in New Jersey is performed by the Chief Engineer, Division of Water Policy and Supply, Department of Conservation and Economic development. Inspection of dams is done by the State at the State's own expense on the complaint of potential failure.

Additional information on dam inspection is also coming from the Corps of Engineers and the United States Committee on Large Dams.

JF:lk

cc: Dean C. Noll
Robert G. Wieland

Report on Dam Inspection

WANAQUE PROJECT

Application No. 32.

Location 23.31.6.4.8 and nearby.

On March 23, 1928, the gates in the main dam were closed except for the passage of 27 m. g. d. through the blow-off, and on March 29, 1928, the water in the reservoir had risen 7 feet.

On March 29, 1928, in company with Mr. H. T. Critchlow, inspection was made of all of the dams in the Wanaque project.

Furnace Road dam was found to be about 50 per cent complete.

Post Pro k Diversion dam , weir and control house were complete except for closing a small breach which was left in the dam for stream control, and installation of recording gage in the control house.

Wanaque Main dam.

Midvale Dam.

Overflow Weir.

Wolf Den Dam, and

Green Swamp Dams Nos. 1, 2, 3 and 4 were complete and were given final inspection.

The construction of all dams has been done in accordance with the approved plans and in a thoroughly workmanlike and satisfactory manner.

John N. Brooks

John N. Brooks
Hydraulic Engineer.

3/31/30

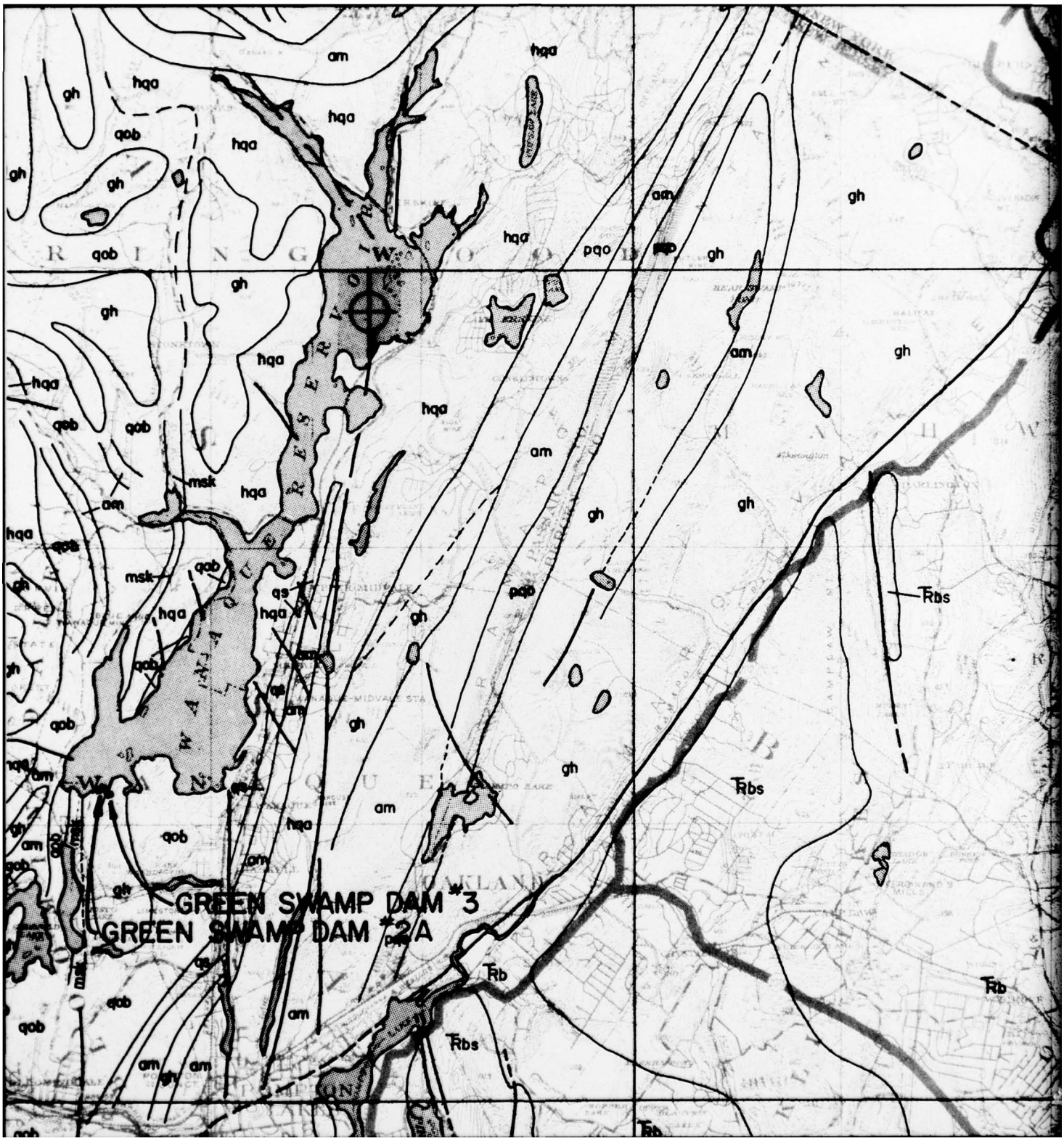
Trenton, N. J.

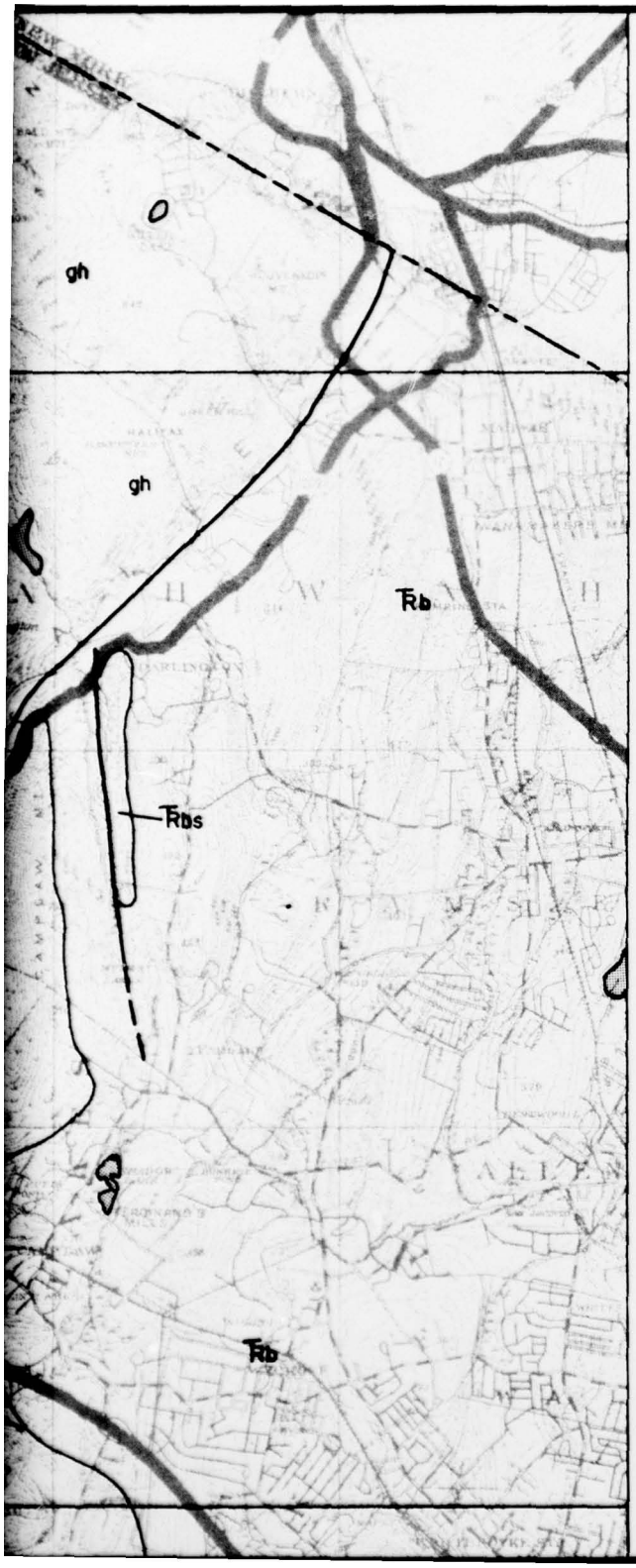
March 30, 1928.

(New Jersey - Dept. of Environmental Protection)

APPENDIX F

REGIONAL GEOLOGIC MAP


GREEN SWAMP DAM *3
GREEN SWAMP DAM *2A
am
hqa
gh
qob
pqo
msk
qs
Trbs
Trb



LEGEND

TRIASSIC

Trb	BRUNSWICK FORMATION
Trbs	BASALT FLOWS

PRECAMBRIAN

gh	MOSTLY HORNBLENDE GRANITE AND GRANITE GNEISS
am	AMPHIBOLITE
pqo	PYROXENE GNEISS; MAINLY QUARTZ-OLIGOCLASE - CLINOPYROXENE GNEISS
hqa	PYROXENE GNEISS; MAINLY QUARTZ-ANDESINE GNEISS WITH BOTH ORTHO-AND CLINOPYROXENE
qo	QUARTZ-OLIGOCLASE-GNEISS
qob	QUARTZ-OLIGOCLASE-BIOTITE GNEISS
qs	SILLIMANITE GNEISS
msk	MARBLE AND SKARN

——— CONTACT LINE

——— FAULT LINE

NOTES:

1. THE PRECAMBRIAN MAP UNITS REPRESENT GENERALIZED GROUPINGS OF ROCK TYPES BASED MAINLY ON MINERAL COMPOSITION. THERE IS MUCH LOCAL VARIATION IN THE MINERAL COMPOSITION.
2. THE CONTACT LINES AND FAULT LINE SHOWN ON THE DRAWING ARE DASHED WHERE INFERRED.

SOURCE:

NEW JERSEY GEOLOGICAL SURVEY TOPOGRAPHIC SERIES AND GEOLOGIC OVERLAY SHEETS 23.

APPENDIX F
REGIONAL GEOLOGIC MAP
SHOWING DAM LOCATION

APPENDIX G

REFERENCES

APPENDIX G

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Appendix D, (Washington, D.C., Department of the Army, Office of the Chief of Engineers).

2. North Jersey District Water Supply Commission - Report 1925, (Newark, N.J., Office of the Commission), 1925.

3. Public Works, Vol. 54, No. 5, May 1923.

4. Water Resources Data for New Jersey, Part 1, Surface Water Records, United States Department of the Interior, Geologic Survey.

5. HEC-1 Flood Hydrograph Package, Hydrologic Engineering Center, Corps of Engineers, January, 1973.

6. Daily Reservoir Water Level and Discharge Record Files from October 1950 to date, owned by the NJDWSC.

7. Water Resources Data for New Jersey, Part 1, Surface Water Records, USGS, Department of the Interior.

8. Passaic River Basin - New Jersey and New York Survey Report for Water Resources, New York District Corps of Engineers, June 1972.

APPENDIX H

GREEN SWAMP DAM NO. 2A

GREEN SWAMP DAM NO. 2A

This dam was inspected on May 23, 1978. The pertinent data and the hydrologic and hydraulic data sheets for this dam are included in pages H-2 and H-3.

Findings: The dam is located 100 feet west of the west abutment of Green Swamp Dam No. 3, and is a 5 to 6-foot high earth embankment, nestled between two massive rock outcrops of granitic gneiss with a total length of 79 feet. The crest width varies from 9 feet at the eastern end to 47 feet at the western end. The upstream slope of 2 feet horizontal to 1 foot vertical is protected with riprap. The toe of this slope was approximately 25 feet from the water's edge. This area is covered with 5 to 8-inch trees. The downstream slope of 1 foot horizontal to 1 foot vertical was sparsely covered with grass, as was the crest. Horizontal and vertical alignments were good. The dam seems to be constructed mainly of sand and gravel.

Record Data: Record drawing Sheet 44 in set 61 (Figure 2) shows the dam in profile and in plan view. The dam has a constant 9-foot crest width, elevation 309.5 with 2-foot thick riprap protecting the upstream slope. No impervious zone or concrete cutoff wall was incorporated in this dam. No grouting was performed. The dam was constructed in September 1927.

Evaluation: The dam seems to have been originally designed as a safety plug. The PMF on the reservoir has an elevation of 308.8. It is highly questionable if the dam can withstand the water level. The trees located in the area between the reservoir's water level and the upstream toe of the dam will offer some protection to the dam during a severe storm because they will reduce the magnitude of the incoming waves and their effects. This protection is temporary because of the shallow root system of the existing trees.

Recommendation: The owner should evaluate the function that the Green Swamp Dam No. 2A should perform, redesign and reconstruct accordingly.

PERTINENT DATA

Drainage Area: 90.4 square miles

Discharge at Dam Site: Not Applicable

Elevation: (Feet above MSL)

Top of Dam - 309.5 feet
Maximum Spillway Design Flood (SDF) Surcharge - 308.8 (See Section 5.0)
Full Flood Control Pool - Not Applicable
Recreation Pool - Not Applicable
Spillway Crest (gated) - Not Applicable
Upstream Portal Invert Diversion Tunnel - Not Applicable
Downstream Portal Invert Diversion Tunnel - Not Applicable
Streambed at Centerline of Dam - 303.0 (low topography)
Maximum Tailwater - None

Reservoir: Length of Maximum Pool - 6.1 miles

Storage (acre-feet):

Recreation Pool - Not Applicable
Flood Control Pool - Not Applicable
SDF Surcharge - 12,280
Top of Dam - 13,656

Reservoir Surface (acres):

Top of Dam - 2,610
SDF Surcharge - 2,590
Flood Control Pool - Not Applicable
Recreation Pool - Not Applicable
Spillway Crest - Not Applicable

Dam: Type - earthfill

Length - 79.0 feet
Height - 6.5 feet above surface
Top Width - approximately 9 feet
Side Slope - U/S 2 horizontal:1 vertical (top) to 3 horizontal:1 vertical
(lower part)
D/S 2 horizontal:1 vertical

Diversion and Regulating Tunnel: Not Applicable

Spillway: Not Applicable

Regulatory Outlet: Not Applicable

CHECK LIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC DATA

DRAINAGE AREA CHARACTERISTICS: Densely forested, few homes, very hilly with minimal cover on bedrock.
ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 302.4 feet (zero acre-feet)
ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not Applicable
ELEVATION MAXIMUM SPILLWAY DESIGN FLOOD POOL: 308.8 feet
ELEVATION TOP DAM: 309.5 feet
CREST: Unpaved

a. Elevation: 309.5 feet
b. Type: Non-overflow
c. Width: 9.0 feet
d. Length: 79 feet
e. Location Spillover: Not Applicable
f. Number and Type of Gates: Not Applicable

OUTLET WORKS:

a. Type: None
b. Location: None
c. Entrance Inverts: None
d. Exit Inverts: None
e. Emergency Drawdown Facilities: None

HYDROMETEOROLOGICAL GAGES:

a. Type: Rainfall recording chart, 24-hour precipitation can, and maximum and minimum temperature recorder. Float type continuous stream level recorder with drum chart.

b. Location: Raymond Dam in Wanaque, New Jersey.

c. Records: Weather data published as climatological Data-Wanaque-Raymond Dam by the National Oceanic and Atmospheric Administration. Streamflow data is recorded by the U.S.G.S.

MAXIMUM NON-DAMAGING DISCHARGE: Not applicable, this is a non-overflow dam.

APPENDIX I

"CONDITIONS"

APPENDIX I

CONDITIONS

This report is based on a visual inspection of the dam, a review of available engineering data, and a hydrologic analysis performed during Phase I investigation as set forth in the Recommended Guidelines for Safety Inspection of Dams, as modified by the contract between the U.S. Corps of Engineers and Gilbert Associates, Inc., Contract No. DACW61-78-C-0114.

The foregoing review, inspection, and analysis are by their nature limited in scope. It is possible that hazardous conditions exist and that conditions exist which with the time might develop into safety hazards and that these conditions are not detectable by means of the aforesaid review, inspection and analysis. Accordingly Gilbert Associates, Inc. cannot and does not warrant or represent that conditions which are hazardous do not exist, or that conditions do not exist which with time might develop into safety hazards.

As required by the Corps of Engineers, the terms "good", "fair", "poor", "condition" have been used in this report to characterize the information obtained from the aforesaid review, inspection, and analysis. The definitions of these terms as used are:

"good condition" - minor studies or remedial measures are required.

"fair condition" - sizeable studies or remedial measures are required due to deficiencies which could be hazardous depending on conditions. Immediate attention is required.

"poor condition" - major studies or remedial measuresare required due to deficiencies which could be hazardous depending on conditions. Immediate studies or corrective action is required.